

# 2PD601BRL; 2PD601BSL

50 V, 200 mA NPN general-purpose transistors

Rev. 1 — 28 June 2010

Product data sheet

## 1. Product profile

### 1.1 General description

NPN general-purpose transistors in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		PNP complement
	NXP	JEDEC	
2PD601BRL	SOT23	TO-236AB	2PB709BRL
2PD601BSL			2PB709BSL

### 1.2 Features and benefits

- Collector current  $I_C \leq 200$  mA
- Two current gain selections
- AEC-Q101 qualified
- Small SMD plastic package

### 1.3 Applications

- General-purpose switching and amplification

### 1.4 Quick reference data

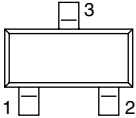
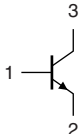
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CE0}$	collector-emitter voltage	open base	-	-	50	V
$I_C$	collector current		-	-	200	mA
$h_{FE}$	DC current gain	$V_{CE} = 10$ V; $I_C = 2$ mA	210	-	460	
	$h_{FE}$ group R		210	-	340	
	$h_{FE}$ group S		290	-	460	



## 2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base		
2	emitter		
3	collector		

*sym021*

## 3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
2PD601BRL	-	plastic surface-mounted package; 3 leads	SOT23
2PD601BSL			

## 4. Marking

Table 5. Marking codes

Type number	Marking code <sup>[1]</sup>
2PD601BRL	ML*
2PD601BSL	MM*

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

## 5. Limiting values

Table 6. Limiting values

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

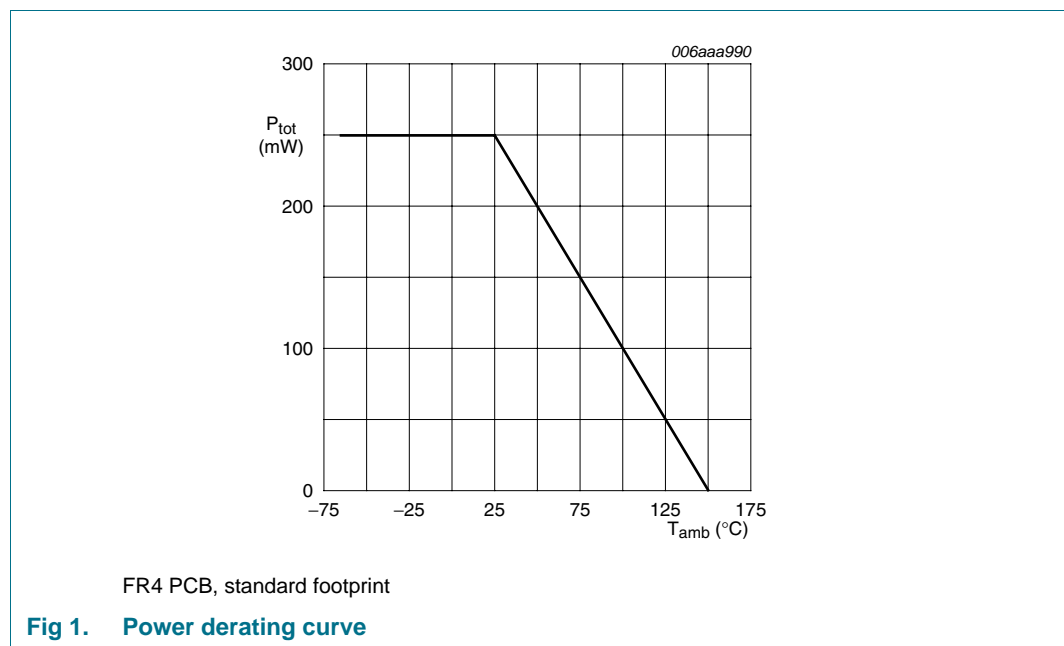
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	60	V
$V_{CEO}$	collector-emitter voltage	open base	-	50	V
$V_{EBO}$	emitter-base voltage	open collector	-	6	V
$I_C$	collector current		-	200	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	300	mA
$I_{BM}$	peak base current	single pulse; $t_p \leq 1$ ms	-	200	mA

**Table 6. Limiting values ...continued**

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	250	mW
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-55	+150	°C
$T_{stg}$	storage temperature		-65	+150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



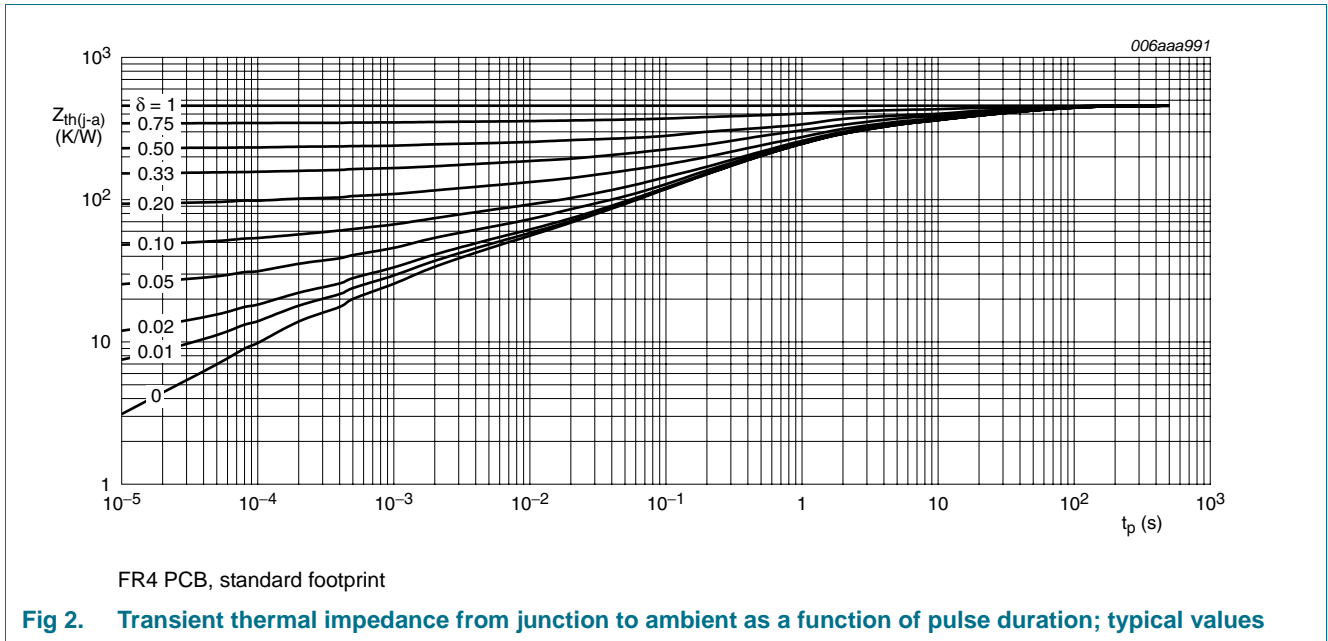
**Fig 1. Power derating curve**

## 6. Thermal characteristics

**Table 7. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	500	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	140	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

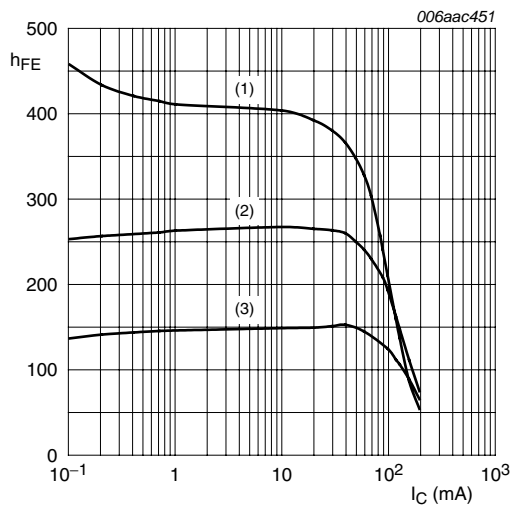


## 7. Characteristics

**Table 8. Characteristics**  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

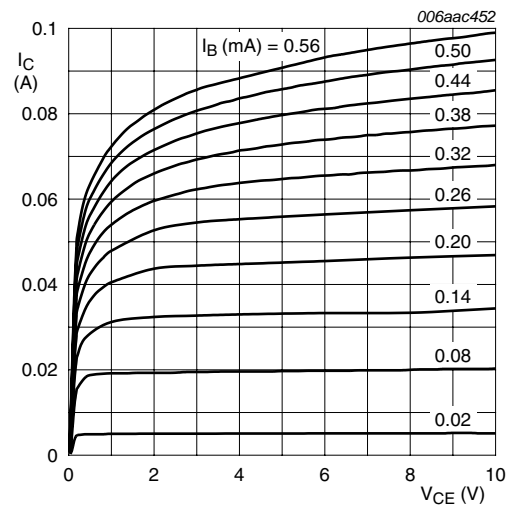
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 60 V; I <sub>E</sub> = 0 A	-	-	10	nA
		V <sub>CB</sub> = 60 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 150 °C	-	-	5	μA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = 5 V; I <sub>C</sub> = 0 A	-	-	10	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 10 V; I <sub>C</sub> = 2 mA	210	-	460	
		h <sub>FE</sub> group R	210	-	340	
		h <sub>FE</sub> group S	290	-	460	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = 100 mA; I <sub>B</sub> = 10 mA	[1]	-	250	mV
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = 6 V; I <sub>C</sub> = 10 mA; f = 100 MHz	100	250	-	MHz
C <sub>c</sub>	collector capacitance	V <sub>CB</sub> = 10 V; I <sub>E</sub> = i <sub>e</sub> = 0 A; f = 1 MHz	-	-	3	pF

[1] Pulse test: t<sub>p</sub> ≤ 300 μs; δ ≤ 0.02.



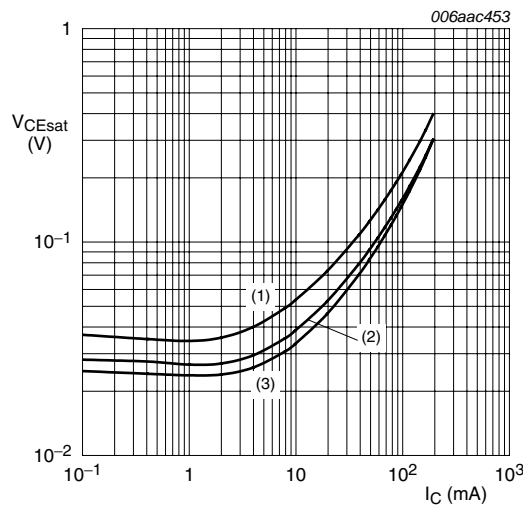
$V_{CE} = 10\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig 3. 2PD601BRL: DC current gain as a function of collector current; typical values**



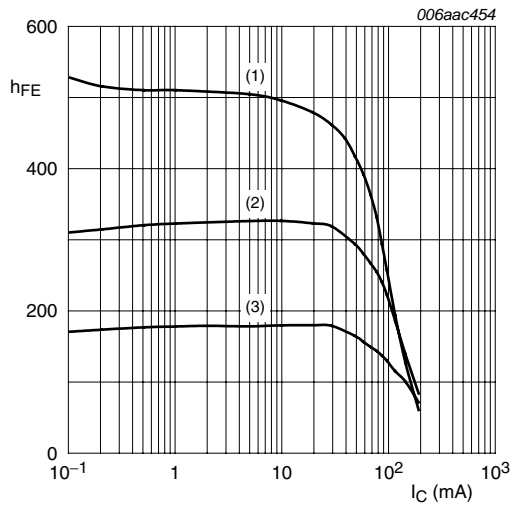
$T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig 4. 2PD601BRL: Collector current as a function of collector-emitter voltage; typical values**



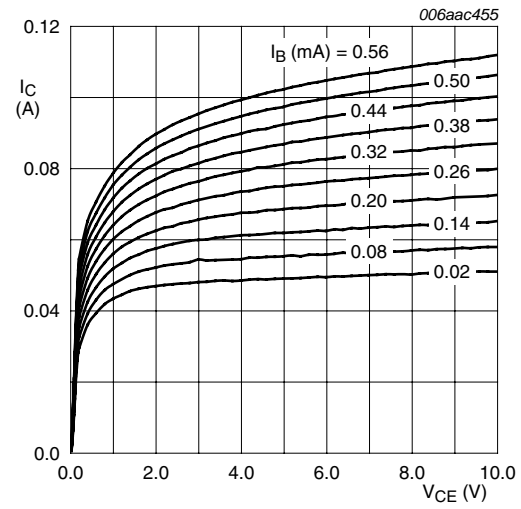
$I_C/I_B = 10$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig 5. 2PD601BRL: Collector-emitter saturation voltage as a function of collector current; typical values**



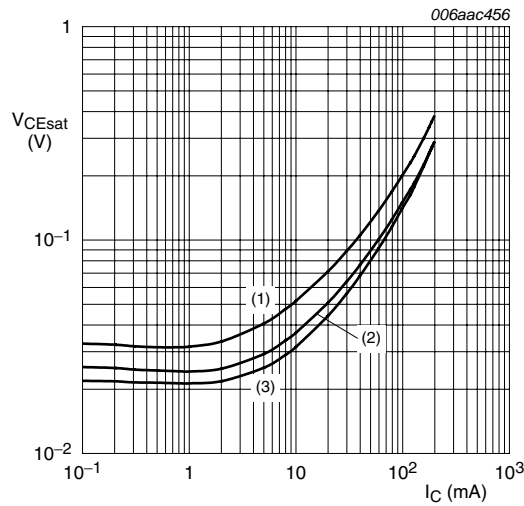
$V_{CE} = 10 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^\circ\text{C}$

**Fig 6. 2PD601BSL: DC current gain as a function of collector current; typical values**



$T_{amb} = 25 \text{ }^\circ\text{C}$

**Fig 7. 2PD601BSL: Collector current as a function of collector-emitter voltage; typical values**



$I_C/I_B = 10$   
 (1)  $T_{amb} = 150 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^\circ\text{C}$

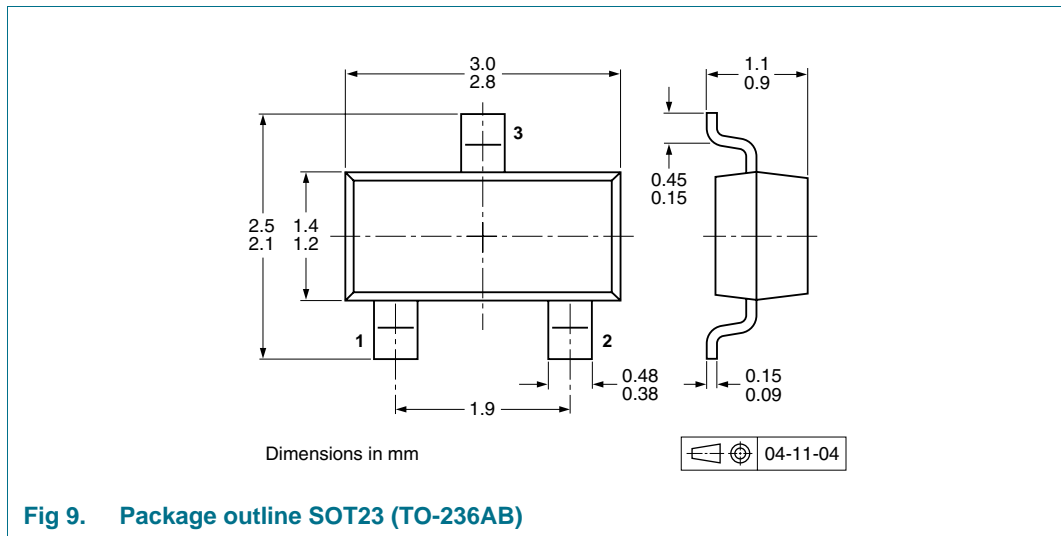
**Fig 8. 2PD601BSL: Collector-emitter saturation voltage as a function of collector current; typical values**

## 8. Test information

### 8.1 Quality information

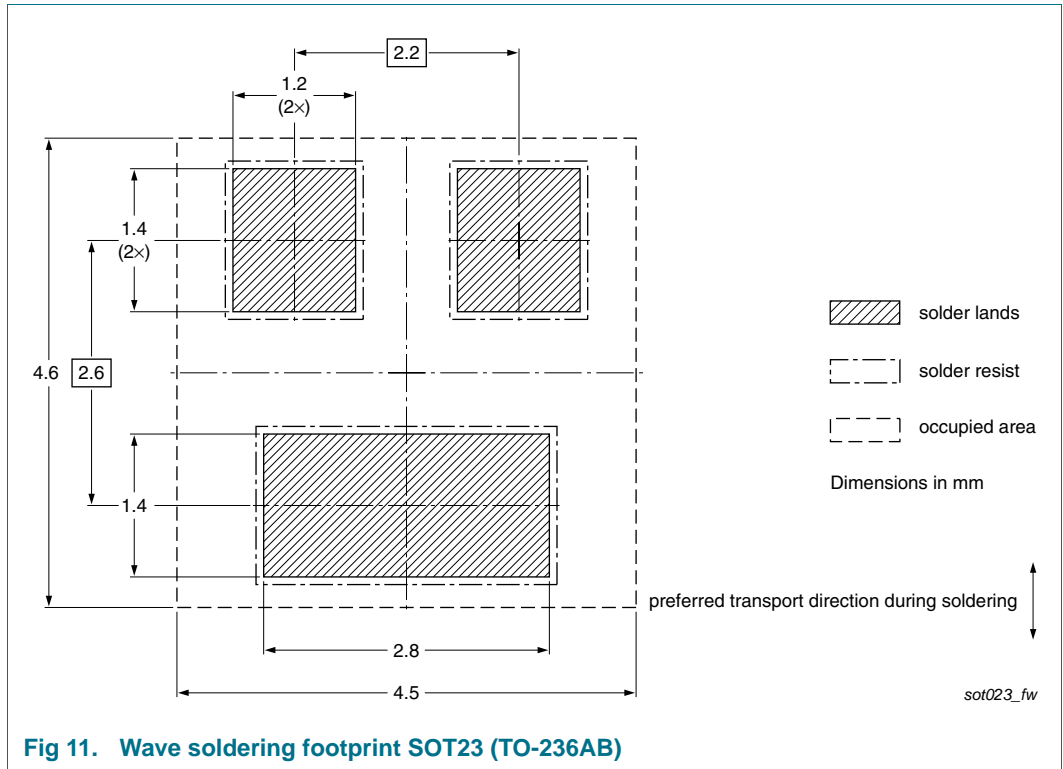
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 9. Package outline









## 12. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
2PD601BRL_2PD601BSL v.1	20100628	Product data sheet	-	-

## 13. Legal information

### 13.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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## 15. Contents

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<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features and benefits . . . . .	1
1.3	Applications . . . . .	1
1.4	Quick reference data . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>2</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Marking</b> . . . . .	<b>2</b>
<b>5</b>	<b>Limiting values</b> . . . . .	<b>2</b>
<b>6</b>	<b>Thermal characteristics</b> . . . . .	<b>3</b>
<b>7</b>	<b>Characteristics</b> . . . . .	<b>4</b>
<b>8</b>	<b>Test information</b> . . . . .	<b>7</b>
8.1	Quality information . . . . .	7
<b>9</b>	<b>Package outline</b> . . . . .	<b>7</b>
<b>10</b>	<b>Packing information</b> . . . . .	<b>8</b>
<b>11</b>	<b>Soldering</b> . . . . .	<b>8</b>
<b>12</b>	<b>Revision history</b> . . . . .	<b>10</b>
<b>13</b>	<b>Legal information</b> . . . . .	<b>11</b>
13.1	Data sheet status . . . . .	11
13.2	Definitions . . . . .	11
13.3	Disclaimers . . . . .	11
13.4	Trademarks . . . . .	12
<b>14</b>	<b>Contact information</b> . . . . .	<b>12</b>
<b>15</b>	<b>Contents</b> . . . . .	<b>13</b>

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